

What is claimed is:

1. A method of providing magnetic fluid treatment at a plurality of distinct points, comprising the steps of:

providing a first and a second length of conduit, each conduit comprising a magnetically conductive material defining a fluid impervious boundary wall with an inner surface and an outer surface and having a fluid entry port at one end of the conduit and a fluid discharge port at the other end of the conduit;

providing a first and a second length of an electrical conductor, each electrical conductor having a first conductor lead and a second conductor lead;

providing a first, a second and a third coupling device, each coupling device establishing a non-magnetically conductive conduit segment comprising a non-magnetic material defining a fluid impervious boundary wall with an inner surface and an outer surface and having inlet and outlet ports, the inner surface of said inlet and outlet ports adapted to receive a segment of conduit;

coiling the first electrical conductor around the outer surface of the first magnetically conductive conduit to form a first uninterrupted coil of electrical conductor encircling the first magnetically conductive conduit;

coiling the second electrical conductor around the outer surface of the second magnetically conductive conduit to form a second uninterrupted coil of electrical conductor encircling the second magnetically conductive conduit;

connecting the outlet port of the first non-magnetic coupling device to the inlet port of the first magnetically conductive conduit;

connecting the outlet port of the first magnetically conductive conduit to the inlet port of the second non-magnetic coupling device;

connecting the outlet port of the second non-magnetic coupling device to the inlet port of the second magnetically conductive conduit, said union providing a fluid impervious, non-contiguous connection between the outlet

port of the first magnetically conductive conduit and the inlet port of the second magnetically conductive conduit; and

connecting the outlet port of the second magnetically conductive conduit to the inlet port of the third non-magnetic coupling device.

2. The method of claim 1 further comprising the steps of:

connecting the first and second conductor leads of the first electrical conductor coiled around the outer surface of the first magnetically conductive conduit to a first electrical power supply to produce an electromagnetic field within the inner surface of the fluid impervious boundary wall of the first magnetically conductive conduit, said magnetic field extending beyond each end of the first magnetically conductive conduit along the longitudinal axis of the first magnetically conductive conduit;

connecting the first and second conductor leads of the second electrical conductor coiled around the outer surface of the second magnetically conductive conduit to a second electrical power supply to produce an electromagnetic field within the inner surface of the fluid impervious boundary wall of the second magnetically conductive conduit, said magnetic field extending beyond each end of the second magnetically conductive conduit along the longitudinal axis of the second magnetically conductive conduit;

introducing a feed stream comprising a fluid column receptive to magnetic treatment to the inlet port of the first non-magnetic coupling device to establish a flow of the fluid column through the connected lengths of conduit;

directing the flow entering the first magnetically conductive conduit to pass through a first area of magnetic treatment concentrated at the inlet port of the first magnetically conductive conduit;

directing the flow discharged from the inlet port of the first magnetically conductive conduit to pass through a second area of magnetic treatment concentrated along a path extending through and substantially orthogonal to each turn of the electrical conductor forming the first coil surrounding the outer surface of the first magnetically conductive conduit;

directing the flow exiting the first magnetically conductive conduit to pass through a third area of magnetic treatment concentrated in the space between the outlet port of the first magnetically conductive conduit and the inlet port of the second magnetically conductive conduit;

directing the flow discharged from the inlet port of the second magnetically conductive conduit to pass through a fourth area of magnetic treatment concentrated along a path extending through and substantially orthogonal to each turn of the electrical conductor forming the second coil surrounding the outer surface of the second magnetically conductive conduit;

directing the flow exiting the second magnetically conductive conduit to pass through a fifth area of magnetic treatment concentrated at the outlet port of second magnetically conductive conduit; and

discharging the fluid exiting from the outlet port of the third non-magnetic coupling device as a processed feed stream.

3. The method of claim 1 wherein the first electrical conductor coil encircling the first magnetically conductive conduit induces a magnetic field to which fluid passing through the first magnetically conductive conduit is exposed.

4. The method of claim 1 wherein the second electrical conductor coil encircling the second magnetically conductive conduit induces a magnetic field to which fluid passing through the second magnetically conductive conduit is exposed.

5. The method of claim 1 wherein the magnetic field concentrated in the fluid impervious, non-contiguous connection between the outlet port of the first magnetically conductive conduit and the inlet port of the second magnetically conductive conduit is greater than the magnetic field concentrated at the inlet port of the first magnetically conductive conduit and the magnetic field concentrated at the outlet port of the second magnetically conductive conduit.

6. The method of claim 1 wherein the supplies of electrical power are of sufficient magnitude to induce magnetic fields to fluid passing through the magnetically conductive conduits.

7. An apparatus for providing magnetic fluid treatment at a plurality of distinct points comprising:

a first and a second length of conduit, each conduit comprising a magnetically conductive material defining a fluid impervious boundary wall with an inner surface and an outer surface and having a fluid entry port at one end of the conduit and a fluid discharge port at the other end of the conduit;

a first, a second and a third coupling device, each coupling device establishing a non-magnetically conductive conduit segment comprising a non-magnetic material defining a fluid impervious boundary wall with an inner surface and an outer surface and having inlet and outlet ports, the inner surface of said inlet and outlet ports adapted to provide for the fluid impervious, non-contiguous connection between a magnetically conductive conduit and an additional segment of conduit;

a first electrical conductor coiled around a segment of the first magnetically conductive conduit to form a first uninterrupted coil of electrical conductor encircling the first magnetically conductive conduit;

a second electrical conductor coiled around a segment of the second magnetically conductive conduit to form a second uninterrupted coil of electrical conductor encircling the second magnetically conductive conduit;

a first electrical power supply having a capacity to energize the first coiled electrical conductor and produce an electromagnetic field within the inner surface of the fluid impervious boundary wall of the first magnetically conductive conduit, the magnetic field of the first coil of wire extending beyond each end of the first magnetically energized conduit substantially parallel to the longitudinal axis of the first magnetically conductive conduit; and

a second electrical power supply having a capacity to energize the second coiled electrical conductor and produce an electromagnetic field within the inner surface of the fluid impervious boundary wall of the second magnetically conductive conduit, the magnetic field of the second coil of wire extending beyond each end of the second magnetically energized conduit substantially parallel to the longitudinal axis of the second magnetically conductive conduit.

8. The apparatus of claim 7 wherein the first and second electrical conductors each comprise a continuous strand of electrical conducting material having a first conductor lead and a second conductor lead.
9. The apparatus of claim 7 wherein each turn of the first electrical conductor coiled around a segment of the first magnetically conductive conduit forms a first uninterrupted coil.
10. The apparatus of claim 7 wherein each turn of the second electrical conductor coiled around a segment of the second magnetically conductive conduit to forms a second uninterrupted coil.
11. The method of claim 7 wherein the first and second conductor leads of the first electrical conductor are connected to a first electrical power supply and the first and second conductor leads of the second electrical conductor are connected to a second electrical power supply.
12. The apparatus of claim 7 wherein the outlet port of the first non-magnetic coupling device is connected to the inlet port of the first magnetically conductive conduit to establish a non-magnetically conductive inlet conduit segment.
13. The apparatus of claim 7 wherein the inlet port of the second non-magnetic coupling device is connected to the outlet port of the first magnetically conductive conduit.
14. The apparatus of claim 7 wherein the outlet port of the second non-magnetic coupling device is connected to the inlet port of the second magnetically conductive conduit to provide a fluid impervious, non-contiguous connection between the outlet port of the first magnetically conductive conduit and the inlet port of the second magnetically conductive conduit.
15. The apparatus of claim 7 wherein the inlet port of the third non-magnetic coupling device is connected to the outlet port of the second magnetically conductive conduit to establish a non-magnetically conductive outlet conduit segment.

16. The apparatus of claim 7 wherein the first and third non-magnetic coupling devices provide for the fluid impervious, non-contiguous connection of a first additional segment of conduit with the inlet port of the first magnetically energized conduit and a second additional segment of conduit with the outlet port of the second magnetically energized conduit to promote the flow of fluid through the magnetically energized conduits.

17. The apparatus of claim 7 wherein the non-contiguous connection of a first additional segment of conduit comprising a magnetically conductive material with the inlet port of the first magnetically energized conduit provides for a concentration of magnetic energy in the space between the inlet port of the first magnetically energized conduit and the first magnetically conductive conduit segment and the connection of a second additional segment of conduit comprising a magnetically conductive material with the outlet port of the second magnetically energized conduit provides for a concentration of magnetic energy in the space between the outlet port of the second magnetically energized conduit and the second magnetically conductive conduit segment.

18. The apparatus of claim 7 further comprising a protective housing enclosing the first coiled electrical conductor, the second non-magnetic coupling device and the second coiled electrical conductor.

19. The apparatus of claim 18 wherein the protective housing comprises a tubular member having a first end plate affixed to the first magnetically energized conduit and a second end plate affixed to the second magnetically energized conduit.

20. The apparatus of claim 18 wherein the protective housing is made of a non-magnetic material.

21. The apparatus of claim 18 wherein the protective housing is made of a magnetic material.

22. The apparatus of claim 7 further comprising a protective housing enclosing the first non-magnetic coupling device, the first coiled electrical conductor encircling a segment of the first length of magnetically conductive conduit, the second non-magnetic coupling device, the second coiled

electrical conductor encircling a segment of the second length of magnetically conductive conduit and the third non-magnetic coupling device.

23. The apparatus of claim 22 wherein the protective housing comprises a tubular member having a first end plate affixed to a first additional segment of conduit connected to the inlet port of the first magnetically energized conduit via the first non-magnetic coupling device and a second end plate affixed to a second additional segment of conduit connected to the outlet port of the second magnetically energized conduit via the third non-magnetic coupling devices.

24. The apparatus of claim 22 wherein the protective housing is made of a magnetically conductive material.

25. The apparatus of claim 22 wherein the protective housing is made of a non-magnetically conductive material.

26. The apparatus of claim 7 wherein a segment of conduit within a piping system comprising a non-magnetically conductive material is sleeved by the first non-magnetic coupling device, the first magnetically energized conduit, the second non-magnetic coupling device, the second magnetically energized conduit and the third non-magnetic coupling device.

27. The apparatus of claim 26 wherein the non-magnetically conductive conduit promotes the flow of fluid through a plurality of distinct points of magnetic fluid treatment.

28. A method of treating a fluid, comprising the steps of:

establishing the flow of a fluid to be treated along a path extending through a first non-magnetically conductive inlet conduit segment, a first magnetically conductive conduit segment downstream of the inlet segment, a second non-magnetically conductive coupling conduit segment downstream of the first magnetically conductive conduit segment, a second magnetically conductive conduit segment downstream of the coupling segment and a third non-magnetically conductive outlet conduit segment downstream of the second magnetically conductive conduit segment; and

establishing magnetic fields having lines of flux directed along the flow path of the fluid and concentrated within the inlet conduit segment, within the first magnetically conductive conduit segment, within the coupling conduit segment, within the second magnetically conductive conduit segment and within the outlet conduit segment.

29. An apparatus for treating a fluid, comprising:

a conduit to receive a flow of a fluid to be treated, the conduit having a first non-magnetically conductive inlet conduit segment, a first magnetically conductive conduit segment downstream of the inlet segment, a second non-magnetically conductive coupling conduit segment downstream of the first magnetically conductive conduit segment, a second magnetically conductive conduit segment downstream of the coupling segment and a third non-magnetically conductive outlet conduit segment downstream of the second magnetically conductive conduit segment;

a first electrical conductor coiled around the first magnetically conductive conduit segment of said conduit with the coils oriented substantially orthogonal to the fluid flow, the first coiled conductor forming an electromagnet establishing a magnetic field having lines of flux directed along the flow path of the fluid and concentrated within the inlet conduit segment, within the first magnetically conductive conduit segment, and within the coupling conduit segment;

a second electrical conductor coiled around the second magnetically conductive conduit segment of said conduit with the coils oriented substantially orthogonal to the fluid flow, the second coiled conductor forming an electromagnet establishing a magnetic field having lines of flux directed along the flow path of the fluid and concentrated within the coupling conduit segment, within the second magnetically conductive conduit segment, and within the outlet conduit segment; and

a supply of electrical power coupled to the coiled electrical conductors to energize the electromagnets and produce the magnetic fields.

30. The apparatus of claim 29 wherein the lines of flux form loops and the magnetic fields are of a strength that allows the flux to extend along the longitudinal axis of the magnetically conductive conduit segments and



concentrate at distinct points beyond each end of the magnetically conductive conduits such that the magnetic flux loops extend from a point where the lines of flux concentrate beyond one end of a magnetically conductive conduit segment, around the periphery of the coiled conductor along the longitudinal axis of the magnetically conductive conduit segment, and to a point where the lines of flux concentrate beyond the other end of the magnetically conductive conduit segment.

31. The apparatus of claim 29 wherein the magnetically conductive conduit segments absorb the magnetic fields and the magnetic flux loops generated by the coiled conductors at the points of flux concentration.

32. The apparatus of claim 29 wherein a segment of conduit within a piping system comprising a non-magnetically conductive material is sleeved by the conduit comprising a non-magnetically conductive inlet conduit segment, a first magnetically conductive conduit segment, a non-magnetically conductive coupling conduit segment, a second magnetically conductive conduit segment and a non-magnetically conductive outlet conduit segment.

33. The apparatus of claim 32 wherein the non-magnetically conductive conduit promotes the flow of fluid through a plurality of distinct points of magnetic fluid treatment.